Addendum: Assessment of wider economic benefits and more expansive induced freight benefits

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1. INTRODUCTION AND PURPOSE

1.1. Purpose

This document is an addendum to the Australian Rail Track Corporation (ARTC) 2015 Inland Rail Programme Business Case (the Programme Business Case), which assessed the viability, benefits, costs and risks associated with Inland Rail. The Programme Business Case formed the key supporting attachment to the Inland Rail Implementation Group Report to the Australian Government.

Inland Rail is a nationally significant piece of infrastructure that offers a long-run, sustainable solution for meeting the east coast’s growing freight task. It provides a step-change in freight productivity, while also catalysing a range of potential benefits from complementary investments in land use and supply chains that leverage the enhanced logistics capabilities of Inland Rail.

In assessing projects of this nature there is a balance to be found in appropriately reflecting the transformative and enabling nature of the investment, the benefits of which are inherently difficult to measure, and maintaining a rigorous and objective evidence-based assessment.

A conventional economic appraisal was undertaken for the Programme Business Case in line with relevant Government guidelines focusing on the direct economic benefits from increased transport efficiency and the standard indirect benefits which flow from moving freight from roads onto rail (such as reduced accident and environmental costs).

Since the release of the Programme Business Case, stakeholder feedback has supported the role of Inland Rail in transforming the economic geography of inter-capital freight and creating additional benefits across the broader economy. This addendum therefore seeks to provide an assessment of these broader benefits in two parts:

- A more expansive calculation of induced freight benefits that considers the benefits that may arise across the supply chain (e.g. to rail operators and retailers in the relevant markets) from the additional freight demand induced by lower supply chain costs of Inland Rail; and
- Wider Economic Benefits (WEBs) that arise because businesses benefit from agglomeration economies (improved accessibility to customers, suppliers and labour markets).

The range of economic results presented in this addendum is designed to acknowledge the transformative nature of Inland Rail and to scope potential expanded economic benefits of an investment in Inland Rail, whilst ensuring the results remain grounded in the rigour of a conventional appraisal methodology. The results presented are consistent with Transport for NSW freight appraisal guidance (2013)\(^2\) and the NSW Government guidelines for the economic appraisal of mining projects.\(^3\)

It is acknowledged that broader economic benefits are, by their nature, more uncertain and difficult to measure. Therefore a degree of caution needs to be applied when interpreting the results.


\(^3\) NSW Government (October 2015), Guidelines for the economic assessment of mining and coal seam gas proposals.
1.2. **Key assumptions in the Programme Business Case**

An evidence-based set of assumptions was developed to underpin the Programme Business Case, to reflect the likely future based largely on existing policy directions, and with Inland Rail integrated into freight networks across the east coast and nationally.

Some of the key inputs and assumptions which underpinned the estimated economic costs and benefits of Inland Rail are presented below:

- **Forecast freight demand** for Inland Rail was produced by ACIL Allen Consulting (ACIL Allen), with markets for intercapital, regional/agricultural and coal freight analysed separately.
  - **Intercapital freight** flows were calibrated to historic Bureau of Infrastructure, Transport and Regional Economics (BITRE) estimates and updated to 2014 using revised BITRE data, actual rail freight flows, and long-run relationships between commodities and drivers of demand, and projected using long-run estimates of GDP growth\(^4\). Mode share was determined by a logit model underpinned by stated preference surveys of willingness to pay of intercapital users on the North-South corridor.
  - **Coal freight** volumes were determined by long-term coal prices and exchange rates which were compared to estimated extraction and transport costs on a mine-by-mine basis in the Surat Basin.
  - **Agricultural freight** was measured based on Australian Bureau of Statistics (ABS) production data, supplemented by rail freight flow data and stakeholder engagement, with projections based on long-run growth in production and choice of export port based on total logistic costs.

- **Economic benefits** focused on direct user benefits in core markets, such as the existing intercapital market, induced freight benefits from increased transport efficiency, and relevant externality impacts that arise from a mode shift to rail.
  - A **50-year appraisal period** was applied, consistent with Australian Transport Council (ATC) guidance\(^5\).
  - The **residual value** was based on a future stream of impacts beyond the 50 year appraisal period, using conservative demand assumptions, and in net terms, counted as a lump sum discounted to the present. This ensured that the full stream of benefits of this long-term strategic investment were appropriately counted and is consistent with national guidelines for economic appraisal\(^6\).
  - A **four per cent discount rate** was adopted, reflecting a 100 year asset life and international practice for large scale enabling infrastructure projects with a long lived benefit stream, although a 7 per cent discount rate was also applied for comparison.
  - **Induced intercapital freight benefits** were assessed by estimating induced volumes and applying reduced rail operating costs arising from Inland Rail.

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\(^6\) Infrastructure Australia 2014 Reform and Investment framework and the ATC 2006 National Guidelines for Transport System Management.
2. EXTENDED ECONOMIC RESULTS

2.1. Expanded calculation of producer surplus

There are a number of potential approaches to estimating producer surplus from induced demand.\(^7\)

The approach used in the Programme Business Case estimated benefits in terms of rail operating cost savings. Therefore, producer surplus from the induced intercapital volumes is derived from the change in above-rail operating costs. This represents the cost savings that could be received by rail companies, or passed on to freight companies or end consumers of the containerised freight. This calculation was based on detailed train operating cost modelling and therefore was considered to be a robust estimate of the potential producer surplus benefits.

An alternative approach is to consider not only operating cost savings, but to estimate the producer surplus in terms of the increase in rail company profits due to higher freight volumes. This approach recognises that the producer surplus encompasses not only underlying costs but actually the ability to expand rail operations and revenues and is considered a valid approach to estimate induced demand benefits.

The calculations may be expanded further to consider producer surplus accruing to multiple businesses along the freight supply chain, not just the rail operator. This broader approach considers producer surplus relating to the sale of a new good, from the perspective of retailers, manufacturers or wholesalers in the supply chain. However, it is acknowledged that this whole of supply chain approach is, by its nature, more subjective and risks not adequately catering for substitution effects (e.g. induced demand on Inland Rail may be a substitute for demand from another supply chain rather than reflecting increased consumption in the end market). A degree of caution therefore needs to be applied when interpreting the results.

Three calculation methodologies were applied to the estimate of producer surplus:

a) The producer surplus of intercapital rail operators - estimated using market-based estimates of rail freight prices, net of the above rail operating costs on Inland Rail;

b) Producer surplus of rail operators and from sale of final good - as in a) plus the producer surplus of the seller of the induced goods in the end market, taking into account industry estimates of price and profit margins. The producer surplus generated in the end market was estimated based on a per-tonne value of containerised freight,\(^8\) and a weighted-average profit margin (excluding tax and interest) for the manufacturing, wholesale trade and retail trade industries;\(^9\) and

c) Producer surplus of businesses along entire supply chain - as in b) plus the combined producer surplus measured along the supply chain for delivery of goods to the end consumer. The

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\(^7\) Producer surplus represents the difference between the price received by a producer and the minimum that would be accepted to produce. Under perfect competition, with a downward sloping, linear demand curve, this is typically measured by calculating half of the fall in cost multiplied by the induced volumes.

\(^8\) BITRE, Australian Sea Freight, 2013-14

\(^9\) Based on the Australian and New Zealand Standard Industrial Classification of industries, and consistent with data contained in ABS catalogues 5209.0.55.001 and 8155.0.
combined producer surplus generated along the entire supply chain was estimated assuming the induced demand reflects additional production and distribution of retail goods as a proxy for an end-user of Inland Rail intercapital freight, taking into account average industry prices, profit margins and flows of intermediate goods and services.\textsuperscript{10}

The economic appraisal results including the three alternative calculations of producer surplus described above are presented in Table 1 below.

<table>
<thead>
<tr>
<th>INLAND RAIL PROGRAMME BENEFIT SCENARIO</th>
<th>BCR AT 4% DISCOUNT RATE ($ M)</th>
<th>BCR AT 7% DISCOUNT RATE ($ M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programme Business Case results (August 2015)</td>
<td>2.62</td>
<td>1.02</td>
</tr>
<tr>
<td><strong>Alternative producer surplus estimation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Producer surplus of rail operators</td>
<td>2.81</td>
<td>1.08</td>
</tr>
<tr>
<td>b) Producer surplus of rail operators and from sale of final good</td>
<td>3.07</td>
<td>1.17</td>
</tr>
<tr>
<td>c) Producer surplus of businesses along the whole supply chain</td>
<td>4.15</td>
<td>1.52</td>
</tr>
</tbody>
</table>

Notes: Analysed over 50 year appraisal period to 2073–74 and discounted applying real discount rates; based on P50 cost certainty; excludes Port of Brisbane Extension; assumes complementary investment on the QR network (Western Line and Brisbane metropolitan network)
Source: PwC 2016

2.2. **Wider Economic Benefits**

The theory of WEBs is well set out in Australian,\textsuperscript{11} United Kingdom (UK)\textsuperscript{12} and New Zealand\textsuperscript{13} economic appraisal guidelines. WEBs refer to the economic impacts of transport investments that are additional to transport user benefits. Economic theory indicates that a transport appraisal would estimate all welfare impacts under perfect competition. However, most markets are not perfectly competitive:

“If only direct user impacts are appraised, some economic impacts would be missing from the appraisal. Analysis has shown that these impacts can be large, and can therefore be an important part of the overall appraisal of a transport investment.”\textsuperscript{14}

\textsuperscript{10} This estimate is derived from ABS input-output tables (catalogue 5209.0.55.001) and Industry data (catalogue 8155.0), using each industry’s value-adding supply of goods that is used in the in the output of the retail trade industry and the profit margin applied to those sales.


\textsuperscript{12} UK Department for Transport (2014), Transport Analysis Guidance Unit A2.1 – Wider Impacts, January 2014.

\textsuperscript{13} New Zealand Transport Agency (2013), Economic Evaluation Manual, Appendix A 10.2

\textsuperscript{14} UK Department for Transport (2014), Transport Analysis Guidance Unit A2.1 – Wider Impacts, January 2014, page1
WEBs include agglomeration economies, increased competition as a result of a better transport system, increased output in imperfectly-competitive markets and economic welfare benefits arising from an improved labour supply.

WEBs are commonly measured and applied to large scale public transport initiatives. However, the application to transformational freight projects is supported by the TfNSW guidelines (2013) which suggest that freight initiatives could generate WEBs as a result of industrial reorganisation (clustering), leading to reduced logistics costs and ultimately driving increases in economic output.\(^{15}\)

It is considered that improved accessibility to customers, suppliers and labour markets (i.e. effective density or agglomeration) from the operating cost savings delivered by Inland Rail, will result in agglomeration economies. The Inland Rail operating cost savings have been estimated to effectively increase the catchment of customers, suppliers and products that may be accessed in the absence of Inland Rail resulting in an increase in productivity.\(^{16}\)

Not all WEBs are appropriate or readily attributable to Inland Rail. WEBs from increased labour supply were not estimated as Inland Rail principally improves connectivity between businesses. Increased competition benefits, whereby a transport project may increase competition as a result of improved transport links may be applicable to Inland Rail, however there is no established methodology to estimate this benefit from the UK or Australian guidelines and hence has not been estimated in this analysis.

The estimate of agglomeration benefits for Inland Rail, set out in Table 2 and Figure 1, was underpinned by several factors, including:

- Inland Rail’s contribution to gross domestic product, underpinned by Australian Bureau of Statistics (ABS) industry gross value added and input-output data and estimated freight volumes;
- Estimated operating costs savings; and
- The elasticity of productivity of the wholesale trade and manufacturing industries based on TfNSW guidelines.\(^{17}\)

\(^{15}\) Transport for NSW (2013), Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives, version 1.6, March 2013, page 110.

\(^{16}\) Inland Rail is also expected to act as a catalyst for businesses to physically locate closer to terminals however this has not yet been estimated in this addendum or in the Programme Business Case.

\(^{17}\) Transport for NSW (2013), Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives, version 1.6, March 2015, page 110.
## Table 2  Economic appraisal results with expanded benefits (incremental to the base case, discounted, real 2014-15 dollars)

<table>
<thead>
<tr>
<th>INLAND RAIL PROGRAMME BENEFIT SCENARIO</th>
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<tr>
<td>c) Producer surplus of businesses along all supply chain</td>
<td>4.15</td>
<td>1.52</td>
</tr>
<tr>
<td><strong>Wider economic benefits (agglomeration)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programme Business Case results with WEBs</td>
<td>2.74</td>
<td>1.06</td>
</tr>
<tr>
<td>a) Producer surplus of rail operators with WEBs</td>
<td>2.92</td>
<td>1.12</td>
</tr>
<tr>
<td>b) Producer surplus of rail operators and from sale of final good with WEBs</td>
<td>3.19</td>
<td>1.21</td>
</tr>
<tr>
<td>c) Producer surplus of businesses along the whole supply chain with WEBs</td>
<td>4.26</td>
<td>1.56</td>
</tr>
</tbody>
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Notes: Analysed over 50 year appraisal period to 2073–74 and discounted applying real discount rates; based on P50 cost certainty; excludes Port of Brisbane Extension; assumes complementary investment on the QR network (Western Line and Brisbane metropolitan network)

Source: PwC 2016

**Figure 1 Economic appraisal results with expanded benefits (incremental to the base case, discounted, real 2014-15 dollars)**

### BCR at a 7% discount rate
- Programme Business Case results (August 2015)
- Programme Business Case results with WEBs
- Producer surplus of rail operators
- Producer surplus of rail operators and from sale of final good
- Producer surplus of businesses along all supply chain

### BCR at a 4% discount rate
- Programme Business Case results (August 2015)
- Programme Business Case results with WEBs
- Producer surplus of rail operators
- Producer surplus of rail operators and from sale of final good
- Producer surplus of businesses along all supply chain

Notes: Analysed over 50 year appraisal period to 2073–74 and discounted applying real discount rates; based on P50 cost certainty; excludes Port of Brisbane Extension; assumes complementary investment on the QR network (Western Line and Brisbane metropolitan network)

Source: PwC 2016